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ABSTRACT

This paper is a survey and description of current doctoral programs in mathematics education in the United States. To gather the data a questionnaire sufficiently flexible and comprehensive to tolerate a variety of programs was developed. The questionnaire was sent to the Dean of the College (School) of Education, Dean of the Graduate Schools, and Chairman of the Department of Mathematics in each of the 200 institutions sampled. The data collected and reported include the following categories: institutional data, professional faculty, description of doctoral programs, financial assistance for doctoral candidates, placement of recent graduates and research, development, and dissemination activities. Although listings of doctoral programs in mathematics education have been made previously, this survey is the first systematic attempt to gather descriptions of doctoral programs on a broad basis. (JP)

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A Survey of Doctoral Programs
in Mathematics Education

by

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F. Joe Crosswhite, Ohio State University

Acknowledgements

We wish, as first priority, to thank those who took time to complete the questionnaires through which the data for this study were gathered. If your experience was comparable to our own, much of the data requested was not readily available and its retrieval required considerable effort. To describe the goals, emphasis, requirements, and many other elusive details of a doctoral program within the constraints of our questionnaire was a difficult task. We only hope that our translation of your comments does justice to your program and that you feel your time has been well spent.

We also want to acknowledge the cooperation of the Center for Science and Mathematics Education at Ohio State University, The ERIC Center for Science and Mathematics Education, and the School of Education at Indiana University each of which made time and/or resources available for this survey.

Finally special words of thanks go to our professional colleagues who reacted to preliminary drafts of the questionnaire suggesting changes and additions. Specific thanks go to Julian Greenwood who assisted in compiling data from the questionnaire.

Foreword

The past twenty years have seen a phenomenal growth in mathematics education as an academic discipline. The roots and origins of mathematics education extend as far back in time as interest in education itself. One of the earliest educational treatises, *The Meno*, uses an example of mathematics teaching to illustrate the Socratic method. Nevertheless, concerns about mathematics education have traditionally been subsumed within the disciplines of mathematics or general education. The emergence of mathematics education as a separate discipline bridging and linking these two diverse disciplines has been a comparatively recent development.

Mathematics education has developed as much from practical and immediate demands of schools as from theoretical and experimental foundations. As a result, doctoral programs in mathematics education have developed in widely diverse ways. This paper is a survey and description of current doctoral programs in mathematics education in the United States. Although listings of such programs have been made previously, this survey is the first systematic attempt to gather descriptions of doctoral programs on a broad basis. The ERIC Center for Science, Mathematics, and Environmental Education is pleased to make it available to the mathematics education community.

Jon L. Higgins
Editor

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A Survey of Doctoral Programs in Mathematics Education

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Mathematics Education, as the name implies, is a kind of middle ground between two important disciplines. At the undergraduate and master's level, it is primarily a practical field of study in that almost all students in the field intend to teach mathematics after graduation. They must, therefore, possess an extensive knowledge of mathematics, combined with a professional knowledge in the field of education and some degree of practical teaching experience.

At the doctoral level the career goals of degree candidates are more varied. Many graduates find their first post-doctoral appointment teaching undergraduate mathematics in two- and four-year colleges. Others accept positions, in departments of education or mathematics, wherein their primary responsibilities are in the area of teacher education. In this role they may teach content courses in mathematics, courses in the methods of teaching mathematics, or supervise pre-service practicum experiences for future elementary or secondary teachers. Some have primary professional responsibility in the area of research and development and almost all are expected to engage in such activities in conjunction with teaching or other professional roles. Some become specialists in mathematics curriculum or instruction in state departments of education or supervisors in local school systems. A few return to teaching in elementary or secondary schools and, of those who do, many become department chairmen or serve in other leadership roles.

To service such a multiplicity of goals, a variety of doctoral programs would be expected. In the past, there has been no single resource to which a prospective doctoral student in mathematics education or his advisor could turn for information as to the availability of doctoral programs or their individual characteristics. Moreover, there has been a proliferation of doctoral programs in mathematics education within recent years with no coordinated effort to examine the pattern of expansion or the implications this might have within the profession or in the academic market place. This survey was initiated in the belief that more detailed and comprehensive information could and should be made available to prospective doctoral candidates and to those who are in the process of designing, redesigning, or continuing doctoral programs in mathematics education.

Purpose

The purpose of this survey was to accumulate, under one cover, as much information as feasible about doctoral programs in mathematics education in the United States. It was not intended that the information provide a basis for comparing the quality of programs. The data do provide a basis for quantitative comparisons and for comparing the professional, academic, and philosophical emphasis of the several programs.

The Questionnaire

With no existing survey data available concerning doctoral programs in mathematics education, the authors were confronted with the task of designing a questionnaire that was sufficiently flexible and comprehensive to tolerate an anticipated variety of programs and yet restrictive enough to permit compilation of the data. The result was a questionnaire that was too long and asked for too much, too soon. It is a tribute to our professional colleagues that we did get a substantial body of interpretable data.

Preliminary to this study, the principal author visited a number of university campuses to interview faculty involved in doctoral programs in mathematics education. While certain elements seemed common in the programs, it became clear that there was considerable lack of uniformity in the way these elements were structured. Differences among programs, for the most part, seemed legitimate reflections of differing goals. However, concerns were expressed regarding the limited communication among institutions offering the doctorate. There seemed little basis for evaluating or modifying one's own program in view of what others were doing in programs with similar goals.

On the basis of these interviews, a preliminary draft of a questionnaire was developed focusing primarily on the components of doctoral programs about which there seemed to be widespread concern, limited information, and divergent practices. A number of professional colleagues reacted to preliminary drafts suggesting additional areas of investigation. The areas covered in the final questionnaire were dictated by the uses anticipated for the resulting report. It was assumed that prospective doctoral candidates would have primary interest in such factors as the faculty involved, program goals and emphasis, admission and graduation requirements, courses required or recommended, examination and dissertation practices, practicum experiences available, the source and level of financial support, and the placement pattern for past graduates. It was also felt that specific professional activities of the faculty and unique resources available within the institution would have relevance to the choice of an institution for graduate study. Finally, the questionnaire was extended in some areas to provide a potential base for generating projections with respect to such factors as the number of future graduates and for conducting follow-up studies. The major categories of data sought in the final questionnaire are outlined below.

- I. Institutional Data
- II. Professional Faculty
- III. Description of Doctoral Program.
 - A. Program Goals and Emphases
 - B. Admission
 - C. Curriculum
 - 1. Foundation or Supporting Areas
 - 2. Mathematics Education

3. Mathematics
4. Languages
5. Dissertation
6. Practicum/Internship Experiences
- D. Advising and Evaluation
- IV. Financial Assistance for Doctoral Candidates
- V. Placement of Recent Graduates
- VI. Research, Development, and Dissemination Activities

Design

The task of locating and identifying doctoral programs in mathematics education did not prove to be a simple one. An initial list of two-hundred institutions that seemed potential sources for such programs was generated using a standard guide to institutions of higher learning. Three letters with self-addressed return postcards were sent to each institution. The letters were addressed to the Dean of the College (School) of Education, Dean of the Graduate School, and Chairman of the Department of Mathematics. The letters indicated that we were concerned with doctoral programs designed to prepare candidates for professional roles in mathematics education regardless of the title of the degree or the administrative unit responsible for the program. Some attempt was made to suggest how such a program might differ from the classical doctorate in mathematics or from a doctorate in education without specialization in mathematics. The postcard permitted the respondent to check whether the institution did or did not offer a doctorate with specialization in mathematics education and, if it did, to record the name and address of a faculty advisor in that program. Following is a summary of the number of returns.

- 200 - institutions sampled
- 209 - all three postcards returned
- 70 - two of three postcards returned
- 21 - one of three postcards returned
- 0 - no returns

As expected, there was not complete consistency where two or three cards were returned. The following indicates the pattern of returns.

	Educ. Dean	Grad. Dean	Math Chairman
Positive	61	55	34
Negative	104	107	128
No Return	35	38	38

Inconsistent response patterns were subsequently analyzed for those institutions for which it was possible to determine definitely if they did or did not have a qualifying doctoral program. This analysis suggested a greater tendency for Deans of Education to correctly identify such programs and for Chairmen of Mathematics Departments to incorrectly deny their existence. There were fourteen instances in which an existing program was identified by the Dean of Education and denied by the Chairman of Mathematics and only one in which the responses were reversed. Deans

of Graduate Studies denied existing programs in seven instances and incorrectly attested to non-existent programs nine times. These inconsistencies may be due as much to the fact that the phrase "doctoral program in mathematics education" is not well-defined as to limited awareness on the part of administrators.

From the returns received supplemented by analysis of recent issues of Dissertation Abstracts International, 84 institutions were identified as those most likely to offer a qualifying doctoral program. There was a conscious attempt to err in the direction of being too inclusive in generating this list. One or more faculty members, suspected of advising doctoral candidates in mathematics education, were identified at each institution - either from the postcard survey or by independent knowledge. A questionnaire was mailed to each faculty member so identified with multiple mailings to institutions where there was some reason to believe there might be separate programs within a department or in separate departments. The cover letter sent with the questionnaire attempted to clarify the phrase "doctoral program in mathematics education," established a single numerical criterion (that the program had or anticipated having an average of at least one graduate per year), and requested return of the completed questionnaire or indication that no program meeting the criteria was offered. Second and third mailings were made to non-responding institutions. In some cases, these subsequent mailings included names suggested by respondents to the earlier mailing.

Replies were received from 66 of the 84 institutions identified. In 56 cases, completed questionnaires were received describing one or more doctoral programs. The additional 10 institutions were identified as having no qualifying doctoral program. Of the 18 institutions not responding to the questionnaire, the authors have independent knowledge that 6 of these do have established doctoral programs in mathematics education. The remaining 12 institutions most likely do not have such programs or grant such a doctorate on an infrequent basis. In summary, we believe the survey data reported here represent approximately 90 per cent of those institutions having established doctoral programs in mathematics education.

Results

The use of a questionnaire is a hazardous way to collect information about different institutions or different programs, for several reasons. While numerical data can be accumulated with reasonable confidence, this is not true of more subjective and descriptive questions, which formed a major portion of our questionnaire. With a large proportion of questions of this nature, the possibility is strong that the respondent (a) did not understand the question in quite the way we anticipated, or (b) believed that the question could not be answered in a way which would do justice to his program, and thus answered a similar but different question of his own, or (c) would not respond to questions whose answers he believed could be misleading.

The next difficulty is that most institutions offered a variety of curricula, internships, and financial aid which, because of the nature of the questionnaire, had to be answered in summary form. We realize, therefore, that we have received some information which represents a kind of "average" curriculum, but gives little or no idea of the variability inherent in the system. The best examples of this were given by Teacher's College - Columbia University and Oklahoma State University, each of which provided us with three sets of data as a means of better describing their three separate programs (Elementary Education, Secondary, and Higher), and by the University of Wisconsin, which gave us almost no data because their doctoral programs are almost totally individualized with respect to such items as admission and program requirements. Clearly the same kinds of program variation would occur at most of the institutions polled, either on a formal basis or on a student-by-student basis considering each candidate's personal background and career goals.

It is unfortunate that, in this first attempt to survey doctoral programs in mathematics education, the method used can be seen to have such obvious drawbacks. Nevertheless, we believe that we have collected a reasonable amount of data which can be used. Certain of these data have been tabulated so the reader may compare directly the statistics given by each institution. These include size data, curriculum data, financial aid and placement of recent graduates. Additional data concerning such highly variable factors as program goals and emphases, practicum experiences, examination practices, faculty research activities, and unique institutional resources do not lend themselves to presentation in tabular form. Selected bits of this information have been incorporated into a descriptive paragraph for each institution. These descriptive paragraphs are, of course, merely summary statements drawn from our collected data. They cannot fully represent the total scope or unique characteristics of a program. Interested readers are encouraged to contact the individual(s) identified for more complete information on specific programs in which they may be interested.

In the sections which follow, summary statistics will be presented for the several categories of data included in the questionnaire. Imbedded within these sections will be paragraphs which seem to describe the "typical" program in mathematics education. Such summary statements are included only to show similarities in trends shared by many institutions. In every detail, there are institutions that may depart markedly from these trends. We desire very much to make sure this is clear to all readers. The reason for describing the "typical" program is to provide a benchmark from which each program can be evaluated in its deviation from the "average".

Organization

The great majority of Mathematics Education programs are planned and administered within a School or College of Education. Occasionally Mathematics Education has department status, or shares department status with Science Education, but most often it is a unit within a larger

department, such as Curriculum and Instruction. Programs administered by a sub-unit within a Department of Mathematics are most frequently characterized by an emphasis upon the teaching of collegiate mathematics as a career goal.

Faculty

There are typically three to four faculty (expressed as full-time equivalents) in the Mathematics Education area who hold Ph.D.'s or Ed.D.'s in Mathematics Education, Secondary Education, or Elementary Education, and whose appointments are either in the School of Education or are joint appointments in Education and the Department of Mathematics. Less frequently, some faculty have full appointments in Mathematics, but they are usually mathematics educators by training and interest, rather than mathematicians per se.

Enrollment

Schools of Education vary enormously in size, ranging from very small "graduate-only" type institutions to large organizations which graduate nearly 2,000 certified teachers annually. The mean size is represented by just over 400 secondary school teachers and 250 elementary teachers qualifying per annum, taught by a faculty of 145 (range 20-480). Mathematics departments are typically much smaller, averaging 44 faculty in the institutions responding.

The average number of students pursuing the doctorate in mathematics education is 17 with about half of these enrolled on a part-time basis. At the average institution, three doctorates in mathematics education have been awarded in each of the past two years.

Average figures may be especially misleading for enrollment or graduation data. Among the institutions represented in this survey, twenty-three (over 40 percent) graduated their first doctorate in mathematics education within the past five years. No students have yet completed the program described at six institutions. The recent increase in numbers of doctorates awarded is indicated in the following:

Number of Doctorates Awarded (54 institutions)

<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
98	96	116	143	166	163

With several new programs included in our sample and knowledge that several relatively large programs were not included, it would not be unreasonable to project approximately 200 doctorates in mathematics education for 1973. Current enrollment data would suggest that almost 1000 students were pursuing doctorates in mathematics education in 1972-1973 with about half this number being full-time candidates.

Priorities

The institutions included in this report showed definite trends in expressed priorities, which can be summarized as follows. Generally, the recipient of the doctorate in Mathematics Education is not primarily prepared to teach college mathematics after graduation. The expressed priorities tended to the following in order of relative frequency:

- | | | |
|----------------|-----|--|
| | (1) | Teacher Education - Secondary |
| | (2) | Teacher Education - Elementary |
| Equally Strong | (3) | University or College Mathematics Teaching |
| | (3) | Educational Research |
| | (5) | Junior College Mathematics Teaching |
| Equally Strong | (5) | Curriculum Development, all levels |
| | (7) | School Mathematics Supervision - local level |
| | (8) | School Mathematics Supervision - State level |

This "normal" set of priorities is most useful when comparing individual institutions. Some few institutions are very definitely oriented, for example, to university mathematics teaching and research as goals for most of their graduates. Some knowledge of an institution's priorities should definitely affect a doctoral applicant's decision relative to seeking admission to a particular institution since the priorities are a major determinant of the doctoral curriculum.

Admission Requirements

General criteria. Relative to the institutions responding, the most frequently mentioned values of overall grade point average and total Graduate Record Examination scores are as follows:

- (Model Value) - Minimum G.P.A. in graduate work = 3.0
Minimum total score G.R.E. = 1000
(About 50% of all institutions polled gave these values.)

Fifty percent of the institutions polled also indicated that they would require an interview for prospective students, a qualification which makes it difficult for one to apply from a distance. Most of the remaining 50% found the interview desirable, but would not insist on it.

Additional criteria may include a score of at least the 50 percentile on the Miller Analogy Test. This is usually supplementary, not required information.

Two years' teaching experience in schools is normally expected prior to admission.

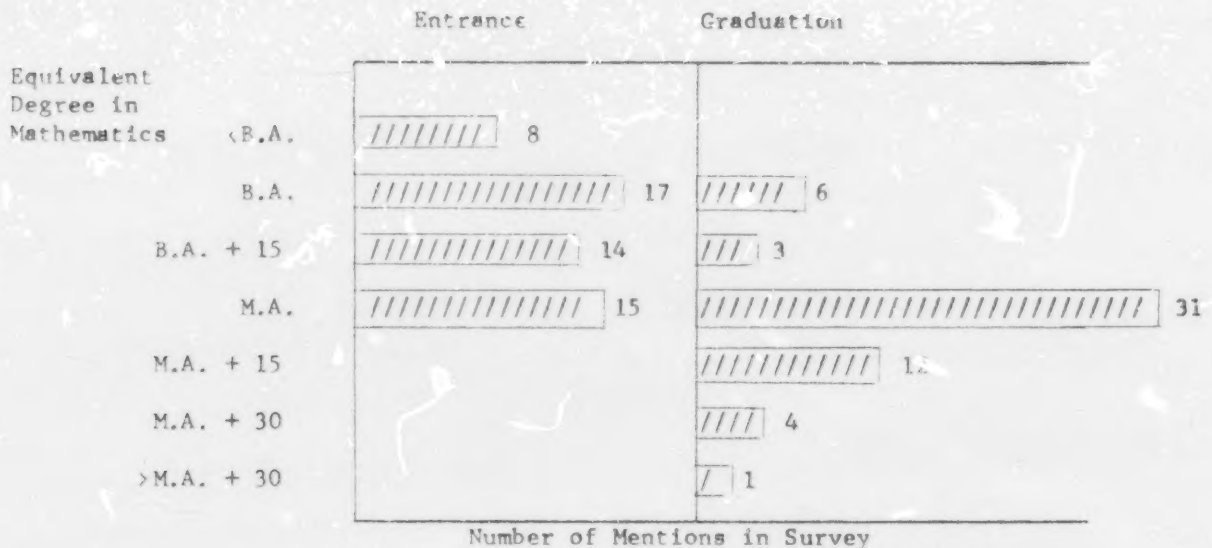
Mathematics Competency

The competency a student is expected to achieve prior to admission is very variable, and is often dependent on the student's goals. If he plans to teach college mathematics, he will normally be expected to achieve a level equivalent to an M.A. in Mathematics plus 15 to 30 semester hours

by the time he graduates. Secondary specialists generally will reach the M.A. level, while elementary specialists achieve somewhat less. Admission requirements vary similarly, with students intending to specialize in college mathematics teaching often expected to enter the program with a master's degree equivalent, while elementary specialists may be admitted with less than a B.A. in Mathematics.

The frequencies with which various levels of competence were mentioned in our questionnaire responses are shown graphically below. For most institutions these are merely guide lines. Individual deficiencies can be removed prior to admission. The following figure represents a summary of mathematics competencies relative to entering and graduating from a doctoral program in mathematics education.

Mathematics Competency



Curriculum

For the purposes of the questionnaire the curriculum was divided into four broad fields, and subdivided into twelve subjects as follows:

- (A) Educational Fundamentals
 - (1) Philosophy (and History)
 - (2) Psychology (including Learning Theory and Theory of Instruction)
 - (3) Sociology
 - (4) Evaluation and Measurement
 - (5) Teacher Education
 - (6) Instructional Media or Technology

(B) Mathematics Education

- (1) Curriculum
- (2) Instruction (in Mathematics Education)
- (3) Supervision or Administration

(C) Research Tools

- (1) Research Design and Methodology
- (2) Statistics
- (3) Computer Science

(D) Mathematics (normally taken in the Department of Mathematics)

Because of the way the question was phrased, it may not have been completely clear to the respondents how the individual courses should be grouped under these broad headings. Occasionally the Research Tool Courses were grouped under Educational Fundamentals, while other respondents noted them as a separate group of subjects. With this variability in responses, the breakdown of a doctoral student's graduate course work would typically be as follows:

	Semester Hrs.	Quarter Hrs.
Educational Foundations	21	35
Mathematics	27	45
Mathematics Education	12	20
Dissertation (may include Research Tool courses)	12	20
Other (e.g., Electives)	9	15
Total	81	135

Within these broad groupings, the breakdown varies so much from institution to institution or even from student to student, that there is little reason in attempting to describe the average program. However, it is possible to observe a trend toward specialization in certain areas. This trend reflects both student preferences or goals and institutional priorities.

Areas in Which Doctoral Students May Specialize

Most Likely

- (1) Secondary Teacher Education
- (2) Secondary Curriculum
- (3) Research Design/Methods and Statistics
- (4) College Teaching

Less Likely

- (5) Elementary Teacher Education
- (6) Elementary Curriculum
- (7) College Curriculum (Math)

Least Likely

(and even unavailable, as a specialty, at some institutions)

Supervision/Administration
Instructional Technology/Media
Theory of Instruction
Learning Theory
Evaluation and Measurement

These specialties within mathematics education are more typically the subject of a single course in many schools, whereas specialization normally implies that one takes two to four courses in an area (six to twelve semester hours).

Language Requirement

No language is required in approximately two-thirds of the doctoral programs. Where both a Ph.D. and an Ed.D. are offered a language requirement is often one of the differentiating characteristics. Languages are seldom required in Ed.D. programs and frequently work in statistics and/or computer science may be substituted for the language requirement in either a Ph.D. or Ed.D. program.

Dissertation

Respondents were asked to indicate which of several types of dissertations were considered acceptable, preferable, or unacceptable as a general rule. Clearly every doctoral committee will make its own decisions on this matter, but the answers received nevertheless indicate a strong preference to some types over others, in accordance with the other overall trends we have observed. In summary, the following is true of the majority of institutions (in order of preference):

<u>Preferred</u>	<u>Accepted</u>	<u>Discouraged or Not Accepted</u>
(1) Experimental	(4) Descriptive	(9) Pure Math
(2) Developmental	(5) Expository/Creative	
(3) Correlational	(5) Survey/Status	
	(5) Historical	
	(5) Case Study	

Internships

The format of the questionnaire did not encourage respondents to indicate the precise nature of the internship experiences, which may vary a great deal in time consumed and amount of work required. Nevertheless, most institutions require some form of internship. Following is an ordered list of those experiences most often required or recommended for doctoral students in mathematics education. The nature of the internship depends, of course, on a student's program and goals.

Required

- (1) Research
- (2) College Mathematics Teaching
- (3) Supervision of Student Teachers
- (4) Supervision of School Mathematics

Recommended

- (1) Teaching Assistantship or Graduate Assistantship to Faculty Member
- (2) Supervision of Student Teachers
- (3) Curriculum Development
- (4) Research
- (5) College Mathematics Teaching

Advising and Evaluation

As expected, a wide range of advisory and evaluation practices exist among the institutions surveyed. However, some generalizations do seem warranted.

A prospective doctoral candidate can almost always expect that his major advisor will be a person whose primary professional interest is in mathematics education. He can also expect that both program advisory and dissertation committees, which usually consist of from three to five faculty members and may be a single committee with both program and dissertation responsibilities, will include representatives from areas outside mathematics education. These committees will most often be selected to represent areas of concentration in the candidate's program or areas specific to his dissertation topic. In most programs, with the most usual exception being those focusing on elementary school teacher education, the committees will include at least one mathematician.

The advisory committees seem to play a large role in the evaluation process. In many cases, they have primary responsibilities in constructing and evaluating written examinations given near the completion of course work and, often, as qualification for dissertation status. The length and focus of written examinations vary a great deal but most frequently sample minor areas of concentration in addition to the major area of mathematics education. Advisory committees often serve as the examining committee in programs requiring oral examinations and an oral defense of the dissertation is an almost universal requirement.

Placement of Graduates

Partial or complete lists of graduates over a three year period (1970-72) were received from 54 institutions. These returns contained placement data for 374 of the 472 persons completing doctorates at the institutions surveyed during that period. If these incomplete returns accurately represent the total placement pattern, approximately three-fourths of the recipients of doctoral degrees in mathematics education find their first post-doctoral appointment in teaching at the college or university level. Approximately half the graduates are placed in departments of mathematics although, in many cases, their responsibilities may focus in teacher education and may include methods courses and

supervision of student teachers. Those who take positions at the school or junior college level often serve in supervisory capacities. A summary of the placements represented follows.

College or University Mathematics Department	- 194
College or University Education Department	- 92
School (K-12) or Junior College Mathematics	- 45
Other (e.g. Research or Development, Administration)	- 43

Tabulated Data

Data have been tabulated by institution for four areas:

Table 1:	Number of Faculty and Students
Table 2:	Program Requirements
Table 3:	Financial Aid
Table 4:	Placement of Graduates

Some preliminary comments might be helpful for each of these tables.

Table 1. The data tabulated for faculty represent the locus of appointment as well as the number of full-time equivalent faculty lines budgeted specifically to mathematics education. To report only budgeted lines would be misleading since it would not represent the total number of mathematics educators involved or the extent of their commitment to mathematics education. Where part-time appointments in mathematics education are involved, we have tabulated the data in the form $x(y)$ where x represents the number of faculty lines budgeted to mathematics education and y the number of individuals represented in those lines. The reader should also realize that we have tabulated only those faculty holding budgeted appointments in mathematics education. At almost all institutions, additional faculty representing several departments would also have more than casual interest and involvement in the mathematics education program.

The data recorded under student enrollment includes full-time and part-time enrollment for the academic year 1972-73 as well as number of graduates for the three year period 1970-72. Individual institutions may have used quite different classification schemes in identifying the number of part-time students.

Table 2. The data recorded under program requirements represents only a sort of average or typical program. Doctoral programs are characterized by a high degree of individualization and most institutions responding indicated a wide-range of curriculum patterns available at the doctoral level. The data should be interpreted as representing a forced response to the request to, "Record the minimum number of hours of graduate credit usually required of your candidates."

Table 3. The summary figures recorded for financial aid represent the range of support levels reported and the approximate number of awards currently held. The number of full-time doctoral students is included as a rough indication of the proportion receiving institutional support. The authors feel that these data may not fairly or uniformly represent the institutions surveyed. Respondents may have reported only those sources of financial support they controlled (e.g. Teaching or Research Assistantships) and ignored competitive and other fellowships available. Prospective doctoral candidates should consult appropriate institutional sources for more complete data on financial aid.

Table 4. Data is recorded for the initial post-doctoral placement of those graduating from January 1, 1970 through December 31, 1972. The data is not complete and the categories tabulated are not fully representative of the nature of professional responsibilities involved. Placement within departments of mathematics or education may involve very similar responsibilities although the concentration of effort is usually indicated by the department of appointment. In spite of these limitations, it is felt the placement data generally reflects program emphasis.

A list of the 56 institutions responding to the questionnaire follows. The abbreviation used in the tables is inserted in parentheses. The tables include data only for those institutions for which data pertinent to that table were available.

University of Alabama (Alabama)
University of Arizona (Arizona)
Arizona State University (Arizona St.)
Auburn University (Auburn)
University of California - Berkeley (Berkeley)
Carnegie-Mellon University (Carnegie-M.)
University of Chicago (Chicago)
University of Colorado (Colorado)
Teacher's College - Columbia University (Columbia)
University of Connecticut (Connecticut)
Florida State University (Florida St.)
University of Georgia (Georgia)
Georgia State University (Georgia St.)
University of Houston (Houston)
Idaho State University (Idaho St.)
University of Illinois (Illinois)
Indiana University (Indiana)
Indiana State University (Indiana St.)
University of Iowa (Iowa)
University of Kansas (Kansas)
Kent State University (Kent St.)
University of Michigan (Michigan)
Michigan State University (Michigan St.)
University of Minnesota (Minnesota)
Mississippi State University (Miss. St.)
University of Missouri (Missouri)

University of Nebraska - Lincoln (Nebraska)
University of New Hampshire (New Hamp.)
New York University (New York U.)
State University of New York at Albany (SUNY-Albany)
State University of New York at Buffalo (SUNY-Buffalo)
North Carolina State University (N. Carolina St.)
University of Northern Colorado (N. Colorado)
Northwestern University (Northwestern)
Ohio State University (Ohio State)
University of Oklahoma (Oklahoma)
Oklahoma State University (Okla. St.)
University of Oregon (Oregon)
Oregon State University (Oregon St.)
George Peabody College for Teachers (Peabody)
Pennsylvania State University (Penn. St.)
University of Pittsburgh (Pittsburgh)
Purdue University (Purdue)
University of Rochester (Rochester)
University of South Carolina (S. Carolina)
Southern Illinois University (S. Illinois)
University of Southern Mississippi (S. Miss.)
Stanford University (Stanford)
Temple University (Temple)
University of Tennessee - Knoxville (Tennessee)
University of Texas at Austin (Texas)
University of Toledo (Toledo)
Utah State University (Utah St.)
University of Virginia (Virginia)
West Virginia University (W. Virginia)
University of Wisconsin (Wisconsin)

Individual Program Descriptions

Following the tables are paragraph descriptions of selected features of doctoral programs at each of the 56 institutions responding to the questionnaire. The level of specificity in these descriptions was necessarily limited by the nature of the data reported. We have not attempted a comprehensive description in any case. Many aspects of the doctoral programs described would exhibit more flexibility than we have been able to reflect here. We encourage the reader to correspond with the faculty member identified to obtain more detailed information about programs in which they might have particular interest.

Table 2. Program Requirements

<u>Semester Hours</u>	Foundation Areas	Mathe- matics	Math Ed.	Disser- tation	Other	Total
Alabama	30	30	12	9	9	90
Arizona	54		18	18		90
/ Ph.D.						
Arizona St. Math Ed.		65	10	15		90
/Ed.D. Math Ed. 30	30	30	15	15		90
Carnegie M.	0	60	4	24		84
Colorado	30	30	10	16		86
(Ph.D.) Columbia	13	38	12	12		90
(Ed.D.)	15	45	12	12	6	90
(Ed.D., College Teaching)	15	62	6	7		90
Connecticut	15	45	14	14		90
Houston	24	36	14	6	19	100
Idaho St.		60	3	6	3	72
Illinois	10	32	16	32	4	94
Indiana	18	40	12	15		85
Indiana St.	15	15	15	12	27	84
Iowa	9	45	6	10	15	90
Kansas	24	32	6	18	10	90
Michigan	20	35	10	24		90
Miss. St.	12	15		20	23	70
Missouri	24	45	12	12		95
Nebraska		15	15	20		56
New Hampshire	9	40	15	12		76
SUNY-Albany		30	18		25	73
SUNY-Buffalo				10		90
N. Carolina St.	9	33	9	15		65
Oklahoma	20	30	20	15		90

Semester Hours (Cont:)	Foundation Areas	Mathe- matics	Math Ed.	Disser- tation	Other	Total
(Higher) Oklahoma St.		60		10	21	90
(Sec.)	24	45	11	10		90
(Elem.)	58	15	7	10		90
Peabody		30	6		18	72
Penn. St.	15	30	18	15		78
Pittsburgh	9	24	18	18	21	90
Purdue	9	39	12		15	75
Rochester	18	30	12	18	12	90
S. Carolina	15	30	6	6	8	60
Texas	21	35	12	6	3	78
Virginia	9	30	9	12	30	90
W. Virginia	24	24	6			70

Quarter Hours

Auburn	36	50	24		20	120
Berkeley	24	15	9	9	15	72
Chicago	30	24	20			90
Florida St.	9	36	18	18	12	93
Georgia	20	60	50	15		145
Georgia St.	45		95	10	10	150
Kent St.	9	60	25	45		139
Minnesota	40	30	30			100
N. Colorado		28	48	18		90
Northwestern	40	18	36	12		108
Oregon	27	40	30	18	20	135

Quarter Hours (Cont.)	Foundation Areas	Mathe- matics	Math Ed.	Disser- tation	Other	Total
Oregon St	21	42	12	20	24	135
(Coll.Tchg)Ohio State		80	20	20	15	135
(Teacher Education)	20	60	20	20	15	135
S. Illinois	32	30	24	36	32	144
S. Miss.		59				118
Stanford	20	36	15	5		108
Tennessee	33	48	18	36		135
Toledo		25	50	15		90
Utah St.	41	49	9	27	9	135

Notes:

Interpretation of these figures should be done with caution since each university tends to classify the coursework into different areas in different ways. Thus, depending on how the respondent read the question; "Research Tool" courses, for example, might either be recorded under "Other" or under "Dissertation," or even in some cases, under "Foundations."

Several other such variations are suspected. These figures should serve more as a guide than as a reliable source.

Table 3. Financial Aid

Time Period <u>YEAR</u>	Amount (Range)	Approx. No. of such Awards (Currently)	No. of Full-Time Doctoral Students
Arizona	2400-3200	9	*
Arizona St.	3000-3600	3	1
Berkeley	1500-3200	6	12
Columbia	2000-4000	26	58
Connecticut	750-3800	2	5
Georgia	2800-3800	15	19
Houston	2250-3600	*	
Indiana St.	1800-3000	*	
Kansas	2500-3200	1	
Michigan	2300-4500	3	5
Nebraska	2700	1	3
Northwestern	1000-3000	5	10
Oklahoma	2500-3000	*	
Oregon	3000	4	9
S. Carolina	2000-4000	*	
Temple	600	3	14
Toledo	3000-3600	*	2
Utah St.	1800-3600	7	8
<u>PER SEMESTER</u>			
Colorado	700-1400	5	5
Indiana	1000-1500	7	12
SUNY-Albany	625-1400	*	
SUNY-Buffalo	1000-1500	3	4
Oklahoma St.	1125-1350	*	
Pittsburgh	1200	2	3
Purdue	1500-1800	4	6
Rochester	1000	1	1
Texas	1400-2000	10	17

Time Period	Amount (Range)	Approx. No. of such Awards (Currently)	No. of Full-Time Doctoral Students
<u>PER SEMESTER (cont.)</u>			
W. Virginia	1000 - 1625	*	2
<u>PER QUARTER</u>			
Florida St.	800 - 1000	13	15
Georgia St.	700	3	4
Kent St.	1166 - 1400	3	3
Minnesota	600	*	6
N. Colorado	850	4	8
Ohio St.	1200 - 1800	20	20
Penn St.	850 - 1050	6	11
S. Illinois	840 - 960	2	3
Stanford	900 - 1050	2	6
Tennessee	375 - 666	5	5

Notes:

This list shows only the range of the "typical" awards, together with the number of such awards currently held. These normally are Teaching Assistantships or Graduate Assistantships given either by Education or Mathematics and requiring up to twenty hours per week of work. (Six hours of classes is normal for a T.A.)

Financial assistance at most universities can, however, come from a surprising variety of sources. For this reason, a list such as this cannot be in any sense comprehensive. It is designed solely to give the reader a general idea of the range of monies available. More specific information can only be obtained by applying to each institution.

No information has been recorded for many institutions in this survey either because our information was incomplete or because it might have been misleading. It should be assumed that all institutions will offer assistance in some form to the majority of its full-time doctoral students.

* Indicates data not available.

Table 4. Placement of Graduates, 1970-72.

Total No. of Graduates		University or College Math Dept.	University or College Educ. School	Jr. College or School Math Dept.	Others
4	Alabama	1	2		1
5	Arizona St.	5			
10	Auburn	1 1/2	3 1/2	2	2
6	Carnegie-M.	6			
1	Chicago		1		
5	Colorado	4		1	
27	Columbia	10 1/2	6 1/2	4	6
1	Connecticut	1			
16	Florida St.	10		4	1
20	Georgia	6	9	3	
7	Houston		2	4	
20	Illinois	11	5		4
22	Indiana	5 1/2	11 1/2	1	4
4	Iowa	1 1/2	2 1/2		
2	Kansas	1	1		
4	Kent St.	2	2		
15	Michigan	7 1/2	2 1/2	2	1
11	Minnesota	4	2	1	3
3	Miss. St.	2		1	
6	Missouri	3 1/2	1 1/2	1	
8	Nebraska	1 1/2	2 1/2	3	1
2	SUNY-Albany			2	
12	SUNY-Buffalo	8		3	
15	N. Colorado	11	2	2	
34	Ohio St.	25	5	2	2
7	Oklahoma	5			
25	Oklahoma St.	20	1	2	

Total No. of Graduates (cont.)		University or College Math Dept.	University or College Educ. School	Jr. College or School Math Dept.	Others
14	Oregon	2	5		3
3	Oregon St.		2		1
21	Peabody	18	1		2
15	Penn St.	2	5	2	2
8	Purdue	2	2		1
2	Rochester	1	1		
1	S. Carolina	1			
3	S. Illinois			2	1
3	S. Miss.	2	1		
4	S. Ford		2		2
10	Temple	3	3		4
2	Tennessee		1	1	
18	Texas	8	4	1	5
6	Utah St.	2 1/2	2 1/2	1	
7	Virginia	2 1/2	1 1/2		3
1	W. Virginia	1			
	Totals	193 1/2	92 1/2	45	43

Notes:

1) "Others" includes, in order of frequency, administration or supervision positions at the local and state level, principal or assistant principal in schools, curriculum development with a state or nationally funded project group.

2) Since most of those finding university or college positions are employed in Mathematics Education, the distinction between Mathematics Department or School of Education is not always meaningful. Many are doing some of the same work, in teacher education, as they would do if employed by the School of Education. This is often, but not always reflected in joint appointments.

3) At the school or junior college level, the positions held are in Mathematics teaching. A larger percentage of these graduates hold department chairman responsibilities in addition to their teaching duties.

4) Where joint appointments have been granted between Mathematics and Education at a college or univer 1/2 has been recorded in each column.

Individual Program Descriptions

University of Alabama

Truman D. Baker
P.O. Box 2432
University, Alabama 35486

Alabama's doctoral program is administered within the Department of Curriculum and Instruction. Professor Baker, the single faculty member in M.E., usually supervises two or three doctoral candidates. Secondary school teacher education receives major emphasis in the doctoral program with internship experience supervising student teachers required. Candidates may also specialize in mathematics teaching at the college level. Both the Ph.D. and Ed.D. are available with a language requirement (two or one with statistics minor) only for the Ph.D. Course work usually consists of approximately one-third mathematics. Although emphasis is placed on research design and techniques courses, appreciable attention is devoted to secondary school curriculum, teacher education and instruction, and psychology/statistics. Experimental studies are preferred in dissertations while historical studies, case studies, and research in pure mathematics are discouraged.

University of Arizona

L. Edwin Hirschi
College of Education
Tucson, Arizona 85721

Set in the context of a large College of Education, the doctoral program is rather new and small at Arizona. The major emphasis is on elementary teacher education and curriculum although candidates may also specialize in secondary teacher education. Entrance requirements, particularly for candidates in elementary education, seem negotiable and the amount of mathematics one would be expected to know appears flexible. A considerable amount of course work in the foundation areas of education is expected. Thus, Arizona would appear to be best suited for prospective candidates who are primarily interested in educational theory and practice relative to school mathematics rather than for those who expect to teach collegiate mathematics. Since the program is yet to yield its first graduate, patterns of placement and dissertation topics are not available. Financial assistance available seems generous.

Arizona State University

Lehi T. Smith
Mathematics Department
Tempe, Arizona 85281

Arizona State University has two separate doctoral programs in the area of mathematics education. The one is the more conventional type administered by the College of Education and drawing on members of the Department of Mathematics in the College of Liberal Arts for support. The other is administered entirely within the Department of Mathematics in the College of Liberal Arts, and is geared specifically to preparing individuals for college teaching.

The person seeking the Ph.D. through the Department of Mathematics must pass the same comprehensive exams as any other Ph.D. candidate. He must also progress in a given field of Mathematics until he is considered capable of doing research in that area. However, the candidate is given the option of doing his paper in an area of mathematics, of trying to synthesize some divergent fields of mathematics in an expository paper, or researching some problems in teaching mathematics at the college level. The person seeking the Ed.D. is expected to

show proficiency in three of the four areas required of the Ph.D. Candidates. Papers deal with problems on teaching mathematics at the school level. Candidates for both types of degrees, although some are in the College of Education, have always been supported financially through the Department of Mathematics.

Auburn University

K.E. Easterday
Department of Secondary Education
Auburn, Alabama 36830

Auburn has a flourishing program in Mathematics Education with four full-time faculty positions and some seventeen candidates for doctoral degrees in the area. The present faculty members are interested in practical research methods, student activities, and program development at both the elementary and secondary levels. The faculty see the chief goal of the doctoral program as that of preparing candidates to do teacher education work in universities and colleges and to develop curriculum. A majority of their recent graduates are indeed fulfilling this expectation. The concentration is on curriculum, instruction, and supervision. Auburn offers the Ed.D. in Mathematics Education, but like some other universities, a clear distinction between secondary and elementary is made when designing a student's program. Those working for a degree in Secondary Education must complete at least twenty more quarter hours of graduate work in mathematics than their counterparts seeking the doctorate with an elementary major. Active work in curriculum development at the elementary level is evidenced by the Auburn TTT program (Performance Based Program) and work in Computer Aided Instruction.

University of California - Berkeley

Lloyd F. Scott
4655 Tolman Hall
Berkeley, California 94720

Although Berkeley offers both the Ph.D. and the Ed.D. in Mathematics Education, most candidates choose the Ph.D. This choice appears to be the pattern at most universities which, like Berkeley, have abolished the language requirements for the Ph.D. In terms of its expressed goals, Berkeley is not typical. Its graduates are expected to be primarily interested in research or development. Entrance requirements are high though not unusual in terms of G.P.A. and G.R.E. scores. One is expected to have a very solid background in mathematics before entering the program. The course work then taken for the doctorate is very heavy in research design, and strong in statistics and curriculum. Instruction, supervision, media, and teacher education requirements appear to be minimal when compared with most doctoral programs in mathematics education.

Candidates for doctoral degrees at Berkeley face both written and oral field examinations in which a unified approach is evidenced. The examination in Mathematics Education includes associated material from other fields, such as mathematics, learning theory and research methods. Many universities require field examinations, but most of them divide the examining load into two or three categories, each of which may be handled by different departments.

Carnegie-Mellon University

A.A. Blank
Department of Mathematics
Pittsburgh, Pennsylvania 15213

Mathematics Education at Carnegie-Mellon does not have the usual connotation. There is no degree granting faculty of Education and courses in education are offered by other departments as adjuncts to their regular programs. Thus one would take a Doctor of Arts degree in Mathematics and append to it a seminar in College Teaching, offered by the Mathematics Department. Clearly most of the graduates of such a program are expected to find positions in college or university mathematics departments. Courses in Education or Instruction are presented as an aid to their work, but not as an area for specialization within itself.

University of Chicago

Professor Max Bell
Graduate School of Education
5835 S. Kimbark
Chicago, Illinois 60637

The fact that Chicago's involvement in Education is only at the graduate level tells one something about their approach. Mathematics Education is a small and rather select program for which high standards are claimed. To quote one of their members, Chicago offers a "distinguished faculty" in education, and "one of the world's great mathematics departments." Graduates are expected to do both teaching and research in education at the university level. The small size of the mathematics education group makes possible considerable flexibility in designing programs for each doctoral student. In this way, the University of Chicago anticipates graduating specialists rather than generalists in mathematics education. The program is new (only one graduate to date) but draws on well-established expertise.

University of Colorado

Roberta Flexer
School of Education
Boulder, Colorado 80302

Teacher education, either elementary or secondary level, is the primary focus in the doctoral program at Colorado. Specific preparation for college mathematics teaching is not seen as an appropriate emphasis in the program although most recent graduates have taken positions in college mathematics departments. Both the Ph.D. (with language requirement) and Ed.D. are offered. The program follows the usual pattern with 2/3 of the curriculum devoted to education and mathematics education and about 1/3 to mathematics. The two full-time faculty appointees in mathematics education are surveying and evaluating secondary and college level curricula, and developing manipulative or "laboratory" materials for elementary children. National Science Foundation "UPSTEP" grants in several areas including Mathematics Education appear to stimulate the interdisciplinary cooperation which is one of Colorado's chief strengths and attractions.

Teachers College/Columbia University

Bruce R. Vogeli
Department of Mathematics Education
New York, New York

Teachers College - Columbia University has a long history of offering a doctorate specifically in the field of Mathematics Education. The programs available attract a large number of students at the doctoral level with many pursuing the degree on a part-time basis. Three separate programs are available. The Ph.D. has a heavier research orientation, requires fewer graduate hours, and includes a double language requirement. The Ed.D. focuses primarily on teacher education or supervision of school mathematics programs with major emphasis at the secondary school level. Cooperative arrangements with colleges, schools, and other agencies in the metropolitan area permit a range of practicum/internship experiences in the absence of an undergraduate teacher education program under supervision of the Teacher's College faculty. A separate Ed.D. in college teaching requires a heavy area of concentration and internship experience in mathematics and includes a single language requirement. Emphasis on the dissertation and on school methods courses is reduced in this program. A wide-range of specializations and practicum experiences are available. The faculty have been quite active in research and curriculum development and are noted for their work in international education.

University of Connecticut

M.S. Wolfe
Mathematics Education Center
Box U-7
Storrs, Connecticut 06265

An unusual feature at Connecticut is the organizational status of Mathematics Education as a separate center with four full-time professors. Primary emphasis in the program is on teacher education with equal priority at the elementary and secondary level. Entrance requirements are apparently high. Those interested in secondary education are expected to begin their doctoral program with a master's degree in mathematics or the equivalent. The program is sufficiently new that by 1972 only one Ph.D. had been graduated. The faculty is involved in a major project (USOE) developing mathematics programs for exceptional children.

Florida State University

Eugene D. Nichols
Department of Mathematics Education
Tallahassee, Florida 32306

The Ph.D. in Mathematics Education is designed primarily for college teachers of mathematics with secondary emphasis on teacher preparation. Most recent graduates have been placed in departments of mathematics. The curriculum followed by doctoral candidates includes a heavy emphasis on mathematics instruction at the school level and a substantial area of concentration in statistics. The level and extent of mathematics expected for admission or graduation varies with the candidates career goals with those preparing for college mathematics teaching expected to reach a level beyond the M.A. in mathematics. The program is characterized by a large faculty (7 full-time)

active in a variety of research and development projects and strong supporting facilities in a University School and computing and C.A.I. centers on campus.

University of Georgia

James W. Wilson
Department of Mathematics Education
Athens, Georgia 30601

The University of Georgia program for the Doctor of Education degree is organized around a core aimed toward developing competencies in educational foundations, mathematics, mathematics education, and research methods. The particular course structure for meeting core requirements, and more important, for developing areas of specialization beyond the core must be decided by the candidate working closely with an advisory committee. There is considerable flexibility in the doctoral program so that the specific course work selection is responsive to the career objectives of the student and the specializations of the various faculty members.

Georgia State University

Dr. Rosalie Jensen
33 Gilmer Street, S.E.
Atlanta, Georgia 30303

Mathematics Education at Georgia State University is three years old at the doctoral level and provides flexibility within its requirements. Georgia State is well staffed, with six mathematics education faculty, and one would anticipate that they will soon be graduating three or four Ph.D.'s annually. Like some of the other institutions, they distinguish between specialists in elementary Mathematics Education and secondary Mathematics Education, but in addition have a K-12 specialty. There is no language requirement for the Ph.D.

Georgia State's in-city location in Atlanta is an attraction, offering a variety of schools for internships and experimental programs, and numerous neighboring colleges and universities. The Mathematics Education faculty appears to be healthily involved in curriculum development.

University of Houston

R.G. Underhill
436 Education
Houston, Texas 77004

Houston's School of Education is attempting to apply some of the currently popular developments in instructional techniques to its own programs by instituting "Competency Based" teacher education with individualized instruction and liberal use of media. There is a concentration of research interest in developing and improving curricula of this type. This represents an additional area of possible specialization for doctoral students. The School of Education is of typical size with two faculty, and nearly four F.T.E.'s in Mathematics Education. Approximately two Ed.D.'s are granted annually in mathematics education -- graduates show a tendency to find positions in junior colleges as mathematics teachers, and secondly in four year colleges as teacher educators.

Candidates for the doctoral degree may enter at the Bachelor's level of Mathematics competence. There is no language requirement.

Idaho State University

Dr. John Hilzman
Department of Mathematics
Pocatello, Idaho 83201

"Mathematics Education" at Idaho State is non-typical. The degree (Doctor of Arts) is given through the Mathematics Department, with the education school contributing only to the extent of conducting a Seminar in Higher Education. The idea of Mathematics Education is new at Idaho (begun in 1971-72), and appears to have been inspired by the felt need to give Mathematics graduates some interest and skill in teaching before they go out to find university jobs. Both the School of Education and the Department of Mathematics are small at Idaho. (21 faculty and 14 faculty respectively.) Five of the mathematics faculty are described as at least half-time in Mathematics Education. The curriculum differs from that taken by a candidate in mathematics in encouraging broad competence rather than specialization in mathematics, and in making provision for teaching experience.

University of Illinois

Kenneth Henderson
Secondary and Continuing Education
Urbana, Illinois 61801

Like many of the larger mid-western universities, Education at Illinois is very well established. The faculty numbers over 200 and they graduate nearly 1200 qualified teachers annually. Mathematics Education is similarly well-developed, and currently about 30 men and women are pursuing doctorates in the area. The work done at the University in mathematics curricula for schools is nationally famous. Two degrees are offered, the Ph.D. and the Ed.D., though 90% of students take the Ph.D. The program is broad and systematic. One can specialize in many areas within education, although one is not usually encouraged to pursue mathematics itself beyond a reasonable level. The concentration is on educational subjects. Candidates for admission are examined thoroughly on the basis of their overall record (G.P.A., G.R.E., Miller Analogy tests), which is considered less reliable than the information obtainable from interviews or from letters of recommendation. A master's degree is a prerequisite for admission to the doctoral program. Financial assistance appears generous, with a "specialist" category available which pays considerably more than the usual half-time assistantship. Specialists may either teach at the local school or do research.

The U.I.C.S.M. project, among others, continues to inspire a high level of publications from Illinois. Much experimental research can begin in the University High School and similar work goes on with elementary schools in Champagne.

Indiana University

John F. LeBlanc
School of Education
Bloomington, Indiana 47401

In terms of the number of bachelor's degrees granted annually, Indiana has the largest Education School of all the institutions polled. Seven faculty members are assigned to Mathematics Education with some 16 students currently pursuing doctorates. Although the Mathematics Department plays little role in administering Mathematics Education, Mathematics faculty do serve on doctoral

committees and otherwise play an active role in advising students. Specialization can take place at all levels of mathematics teaching from elementary to college. The Mathematics Education faculty are themselves specialists in either elementary or secondary, and may hold half-time appointments in Curriculum and Instruction at these levels. Admission requirements include a high percentile rank on the quantitative portion of the G.R.E. with lower emphasis on verbal. Only one year of teaching experience is expected compared to a normal two or three elsewhere. Candidates enter the program with a master's in mathematics or better, from which point their curriculum concentrates on education and Mathematics Education. The bulk of Indiana's graduates go on to university jobs in Mathematics Education, very many holding joint appointments with Mathematics Departments.

Indiana State University

W.G. McCarthy
Department of Elementary Education
Terre Haute, Indiana 47809

Mathematics Education at the doctoral level is a rather small and new operation in a very large Education School. It is administered by the Department of Elementary Education, and the Ph.D. granted is in Elementary Education. It thus does not appear that this institution yet offers the possibility of specialization in Mathematics Education at the secondary or college level. With this broad limitation in mind, the program offered is comparable with that offered for elementary specialists at other schools. The Ph.D. contains a double language requirement, but one or both of these may be substituted by Statistics, Computer Science or both.

University of Iowa

Marilyn Zweng
Mathematics Education
MacLean Hall
Iowa City, Iowa 52240

Iowa's College of Education is strongly oriented to elementary education, and those persons interested in mathematics at this level would take degrees in Elementary Education. For this reason, students interested in secondary or college level mathematics teaching, work through a special joint program established between Education and the Department of Mathematics. The degree granted in this way is a Ph.D. in Mathematics Education, a qualification currently obtained by only one or two students annually. As one might predict, (with the Department of Mathematics playing a major role in the design of the program), a fairly high level of mathematical competence is expected of graduates by comparison with many other institutions. Mathematics courses form at least half of one's curriculum, if he enters without any graduate credit, and the comprehensive examinations reflect this emphasis. The reasoning is that since one's dissertation will be in Education, then the bulk of the coursework should be mathematics, if a proper balance is to be achieved.

University of Kansas

Dr. Lelon R. Capps
College of Education
Lawrence, Kansas 66044

Mathematics Education at Kansas is definitely an education program rather than one in mathematics. Students are expected to have completed 32-40 hours of graduate mathematics before being admitted to the doctoral program, from which point the bulk of their work will be taken in the School of Education. Of the two degrees offered, the great majority choose the Ph.D. over the Ed.D. Recent faculty research and development has involved working with teachers in neighboring school districts on projects of their own, and has in addition resulted in publication of a K-6 series of texts, and two standardized tests in secondary mathematics.

Kent State University

James W. Heddens
College of Education
Kent, Ohio 44242

Considering the substantial investment in undergraduate teacher education at Kent State, the doctoral program in Mathematics Education (administered through Graduate Education) is small. There are, however, four faculty members working at least half-time in the area, and they are active in research and professional participation at meetings. The program offered compares well with those of other institutions. Candidates take a fairly heavy load of mathematics courses at the graduate level, considering the fact the expressed program goals favor specialists in elementary education. Specialization can, however, take place in all of the usual related fields within education, and it is reasonable to suppose that the limitations of our questionnaire have prevented the respondents from fully indicating the degree of flexibility that a candidate may actually find possible in designing his program.

University of Michigan

Arthur F. Coxford
1025 School of Education
Ann Arbor, Michigan 48104

Joseph N. Payne
1029 School of Ed.
Ann Arbor, MI 48104

Michigan graduates a large number of teachers annually from its undergraduate programs and is similarly active at the doctorate level. Though Mathematics Education is administered in the traditional fashion through the School of Education, there are an equal number of faculty appointments to the area from Education and Mathematics. Both the Ph.D. and Ed.D. are available. Ninety percent of the candidates pursue the Ph.D. although the Ph.D. includes a language requirement. Dissertations involving experimental studies are preferred with a bit more latitude existing for the Ed.D. Primary emphasis in the doctoral program is upon teacher education with specialization at either the elementary or secondary level. Secondary emphases are identified in educational research and curriculum development. Graduates are expected to reach at least the M.A. level in mathematics. The faculty have been very active in curriculum development through publication of school mathematics texts. Mathematics learning in classroom situations is a primary research interest with historical or comparative research frequently being undertaken also.

Michigan State University

Professor I. Blyth
Department of Mathematics
East Lansing, Michigan 48827

Michigan State University offers a program administered jointly by the Departments of Mathematics and Elementary Education with the result that one can choose to do either a Ph.D. in Mathematics Education through the Mathematics Department, or a Ph.D. in Education. The differences in emphasis between the two should be established by writing directly to Michigan State University but one would anticipate that those persons interested in secondary or college level mathematics would choose the former alternative and would be given a curriculum correspondingly stronger in mathematics coursework. A student at Michigan State University could draw on a very large education school which should make sub-specialization possible in areas of interest to the student. Students are expected to enter the doctoral program with much of the mathematical background completed, though for the degree in secondary or higher, one is expected to do perhaps 15 semester hours of credit beyond the master's level. The Ph.D. carries a double language requirement. A healthy number (26) of students are pursuing their doctorate at Michigan State University, an indication of a well-established set of programs.

University of Minnesota

David C. Johnson
Mathematics Education
330 Peik Hall
Minneapolis, Minnesota 55455

Minnesota's doctoral program (Ph.D.) leans toward secondary teacher education rather than elementary, although there is every indication that both areas are well established, and that Minnesota graduates have found university positions at all levels. The Mathematics Department is large, but does not play a direct part in administering the program which is handled in traditional fashion through Education. Mathematics Education is a separate unit in the School of Education with five budgeted faculty positions. The limited data reported prohibit a more detailed description of program elements. However, the size of the institution and activities of the faculty suggest that many areas of specialization would be available. In particular, active involvement in the area of computer assisted instruction would seem to be potentially available.

Mississippi State University

Gordon C. Johnston
Secondary Education, Drawer ED
State College, Mississippi 39762

Mathematics Education is a small program at Mississippi State University, administered by the Department of Secondary Education and utilizing the services of only one faculty member. The Mathematics Department thus takes responsibility for designing that side of a student's curriculum. Admission policy favors local students already in the system. There is no indication in the questionnaire response indicating the nature of the course work in Mathematics Education, per se; students concentrate on mathematics and education courses offered through other units in the School of Education.

University of Missouri

Robert Reys
209 Laboratory School
Columbia, Missouri 65201

Missouri offers two doctorates of which the Ph.D. (with no language requirement) is most often chosen. Primary emphasis is placed on teacher education, equally at elementary and secondary level, with secondary emphasis on college mathematics teaching or school mathematics supervision. Recent graduates have been placed in almost equal numbers in Mathematics and Education Departments at colleges or universities. A research practicum experience is required. Entrance and exit requirements in mathematics vary with program goals but a level of 15 semester hours beyond the M.A. is indicated as typical of graduates. The candidate has considerable freedom in choice of a dissertation topic with no preference expressed for the type of study involved.

University of Nebraska

Milton W. Beckman
Hurzlik Hall, Room 215
Lincoln, Nebraska 68508

About twelve students are currently pursuing doctorates in Mathematics Education under two full-time faculty in the Department of Secondary Education. Mathematics Education appears to be a specialization within Secondary Education rather than a program of its own. The "core" subjects in one's curriculum would be the more general topics of Secondary Education with Mathematics Education becoming a minor.

Admission requirements are fairly relaxed, though this of course may mean that much depends on the interview. There is no specific prerequisite in mathematics, and one could graduate with as little as 15 hours of graduate mathematics courses though a master's degree is preferred. There are no language requirements for either the Ph.D. or the Ed.D.

Nebraska is proud of their relationship with the Lincoln Public Schools. This cooperation, combined with emphasis on Secondary Education, may contribute to the apparent preference of recent graduates for mathematics jobs at high schools or state colleges.

University of New Hampshire

M. Evans Munroe
Department of Mathematics
Kingsbury Hall
Durham, New Hampshire 03842

The University of New Hampshire has recently established its first doctoral program in Mathematics Education. This institution expects its graduates in Mathematics Education to be well equipped to teach university mathematics, while simultaneously being sufficiently competent in Education to develop curricula and teach in Mathematics Education. This orientation is compatible with the fact that Mathematics Education is organized under the Department of Mathematics. A high proficiency in Mathematics (M.A. plus one year) is expected by the time of graduation. In fact, students take the same examination in Mathematics as do others who are Ph.D. candidates in Mathematics. The main difference between Mathematics and Mathematics Education Ph.D.'s lies in the nature of the dissertation. Dissertations in Mathematics Education

will be pedagogical research. Students of Mathematics Education also complete coursework in Education Foundations and Mathematics Education approximately to the degree one would experience at most of the institutions surveyed. Part-time teaching experience in schools for a one year period is mandatory for all students. The School of Education takes part in these programs only in that Education faculty serve on student committees and in its course offerings. There are as yet no graduates with this degree.

New York University

Stephen S. Willoughby
Department of Mathematics
New York, New York

Limited response to the questionnaire prohibits detailed description of the doctoral programs at New York University. Three major program areas were identified with enrollment proportions as indicated: for college teachers of mathematics (50%), for college teachers of mathematics education (40%), and for supervisors of school mathematics (10%). Focus in the teacher education program is at the secondary school level and is supported by a TTT program. NYU enrolls a very large number of part-time doctoral students from the metropolitan area.

State University of New York at Albany

Ernest A. Ranucci
Education 108
Albany, New York 12203

SUNY at Albany gave its first two doctorates in Mathematics Education in 1972. The initial program is aimed at the secondary level only, since this is the emphasis of the School of Education. The school itself is very substantial, granting nearly 100 bachelor's degrees and 25 master's degrees annually to future mathematics teachers; one would assume that all related areas within education are well established. Prospective students could assume that some flexibility will be possible in designing a curriculum that is consistent with their personal goals.

A novel project just starting at Albany is an experimental professional semester for mathematics and science teaching majors in which a considerable amount of coordination is introduced between the two areas.

State University of New York at Buffalo

Gerald R. Rising
Department of Instruction
Buffalo, New York 14214

The undergraduate program in education is small at Buffalo, but by comparison the school seems active at the graduate level. There are over 30 students working for doctorates in Mathematics Education though most are on a part-time basis. Courses are taught by two half-time faculty, one from the Department of Instruction and the other from Mathematics. The expressed program goals are unusual -- research and development of curriculum coming highest on the list, above teaching, either of mathematics or in education. Thus the Mathematics Education coursework emphasizes detailed studies of current curricula in the secondary schools, a training which is consistent with the program goals. In general, students are not encouraged to specialize and may take courses in any of a number of areas. There appears also to be considerable flexibility in the

way a student might divide his time between the fields (Foundations of Education, Mathematics, and Mathematics Education). Graduates from the program currently show a strong preference for mathematics teaching in local state colleges.

North Carolina State University

Herbert E. Speece
Math and Science Department
Raleigh, North Carolina 27607

Mathematics and Science Education have been combined into a single department in North Carolina State's modestly sized but forward-looking School of Education. The school confines its attention to secondary education, thus a specialty in elementary mathematics curriculum or teacher education is not possible. Courses in secondary curriculum and teacher education are designed to include consideration of both science and mathematics, thus giving students a feeling for the interdependence of the two areas.

Students begin the doctoral program having already completed the equivalent of a master's degree in mathematics. There is a double language requirement, though one of the languages may be replaced by computer science or statistics proficiency.

The program described was planned and initiated very recently (1971). No students have yet been granted their degree.

University of Northern Colorado

T.D. Cavanagh
Department of Mathematics
Greeley, Colorado 80639

Northern Colorado is interesting in that although the Mathematics Department administers Mathematics Education, and employs nearly all the Mathematics Education staff, it is nevertheless primarily an Education program, similar to those at other institutions. No entrance competence is specified, and the graduation expectancy in mathematics is a Master's degree equivalent, as is the case at the majority of institutions. Within the Mathematics Education area, the orientation is towards Secondary Teacher education, followed by elementary. Curriculum development at these levels is also a high priority.

Education faculty serve on the doctoral student committees and assist in research through their department of Research and Statistical Methodology consulting. Students are expected to gain some short-term field experience in local schools as part of the degree. The long-term (two year) teaching requirement, often considered prerequisite to a doctoral program, may be done at Northern Colorado while the degree is in progress.

Northwestern University

Richard A. Lesh
School of Education
Evanston, Illinois 60201

Northwestern's undergraduate program in education is very small; as a partial consequence, Mathematics Education is a department jointly administered by Education and by Mathematics. Of the two faculty members concerned, one has a joint appointment, while the other is from the School of Education,

but both are Mathematics Educators by training. Other personnel from both areas are of course involved on an advisory and policy making basis, as well as serving on doctoral committees.

Students of Mathematics Education are judged to be mainly interested in becoming teacher educators and educational researchers, since an interest in college teaching of mathematics would indicate a degree program in mathematics alone. The curriculum concentrates, therefore, on education and mathematics education, requiring fewer total hours of mathematics by comparison.

Northwestern's situation in Chicago makes it possible for students to take courses at the University of Chicago, and to participate in a wide variety of clinical (internship) experiences in the Chicago area.

Ohio State University

F. Joe Crosswhite
Faculty of Science and Mathematics
Education
283 Arps Hall
Columbus, Ohio

The Ohio State University recognizes two areas within Mathematics Education that lead to different curricula for doctoral students -- (1) College Teaching of Mathematics and (2) Teacher Preparation or Curriculum Development for the Schools. For the first case, (Plan M.), students take 30-45 quarter hours of mathematics beyond the Master's degree, with a reduced course load in professional education. Practicum experience in undergraduate mathematics teaching is required under the supervision of the Mathematics Department, and research in curriculum or teaching at this level is assumed. By contrast, those students on "Plan E" -- the education alternative, may take little mathematics beyond the Master's degree, developing instead supporting areas within education (psychology, teacher education, curriculum and supervision, or the like). Their practicum experiences and research will be related to these goals. Financial assistance is available in the form of teaching associate in either education or mathematics, or through Research Associate, usually with the ERIC Information Analysis Center for Science and Mathematics Education. The presence of this ERIC center at Ohio State is a noteworthy feature for students in Mathematics Education as is a five-quarter field-based program in teacher education within which all doctoral students have some practicum experience.

University of Oklahoma

Thomas J. Hill
Department of Mathematics
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Norman, Oklahoma 73069

At Oklahoma, Education administers the Mathematics Education program, yet two of the three faculty appointments in Mathematics Education are joint appointments with the Mathematics Department. Entrance requirements are not severe; an interview is required. As with many other institutions, admission to the doctorate program follows completion of the master's in mathematics or the equivalent, from which point onward one's work is largely in educational areas. The program graduates 2-3 Ph.D.'s or Ed.D.'s annually, all in secondary programs. (Specialization is not possible in elementary or college teaching in curriculum.)

Oklahoma State University

John Jewett
Department of Math.
Stillwater, Oklahoma
74074

Vernon Troxel
Department of Ed.
Stillwater, Oklahoma
74074

Oklahoma State took the unusual but helpful step of returning three questionnaires, each describing a different specialization. The doctorates in College Teaching of Mathematics, Secondary Level Mathematics or Elementary Level Mathematics are each treated separately and administered jointly by the Departments of Education and Mathematics. The program in College Teaching is the larger with 20 graduates in the 1970-72 period. The multiple descriptions give one a chance to examine what is in fact the situation at many other universities: students' programs vary a great deal depending on the level of mathematics in which they specialize.

Thus while the College Teaching Specialists universally find positions in Mathematics Departments, one would expect Elementary Specialists to go into educational fields almost exclusively. The future college teachers take 60 hours of mathematics out of their total of 90. By contrast, the elementary specialists take nearly 60 hours of educational foundations and take few graduate level math courses. They may even count undergraduate math courses on their graduate credit. College teachers are encouraged to do a thesis in pure mathematics. For obvious reasons of competence in the field, this is actively discouraged for Secondary and Elementary Specialists.

It is unfortunate that these kinds of variations, which exist at most institutions polled, do not always show up under the constraints of the questionnaire. This degree of flexibility is possible elsewhere, and should be borne in mind when reading the comments on each institution.

University of Oregon

Alan R. Hoffer
Department of Mathematics
Eugene, Oregon 97403

A moderately large School of Education is the setting for Oregon's active doctoral program, administered by the Department of Curriculum and Instruction. The university's Mathematics Department assists, of course, in advising students; one faculty member in Mathematics Education holds a joint appointment. "Curriculum and Instruction" is considered a single subject, as is "Curriculum and Supervision" -- thus the tabulated data on curriculum is less analytical in Oregon's case. Students may be accepted without a formal interview, and sometimes with an apparently weak mathematical background, but they must be willing to spend the summer at Oregon prior to admission and must demonstrate their capacity for advanced mathematics. Statistics is strongly stressed, and may replace one of the two language proficiencies required for the Ph.D. or the single language required in the Ed.D. Teacher education, with greater emphasis at the elementary level, and college teaching of mathematics with emphasis on the junior college level share priority in program goals. Recent graduates have been placed most often in Education Departments.

Oregon State University

Howard Wilson
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Corvallis, Oregon 97331

In an unusual, but reasonable departure from the norm, Mathematics Education is part of the Department of Science Education at Oregon State. The faculty member directly concerned has a joint appointment shared with the Department of Mathematics. Graduates are expected to be more interested in teacher education or supervision than in themselves teaching mathematics. Elementary mathematics is not stressed, and students enter the program to qualify in secondary or higher level mathematics education. Having a Master's degree equivalent in mathematics is a prerequisite. It should be realized that Mathematics Education at the doctoral level is only four years old, and not yet fully developed. When this is achieved, the department will be renamed "Science and Mathematics Education," thus recognizing the equality of status of the two areas.

George Peabody College for Teachers

Otto Bassler
Department of Mathematics
Box 38
Nashville, Tennessee 37203

Being primarily a teachers college, the mathematics department at Peabody offers courses in mathematics and mathematics education. Additional courses in mathematics may be selected from the mathematics offerings at Vanderbilt University. Peabody's program is designed to train college level teachers in mathematics first, and teacher educators second. The great majority of their recent graduates have gone into Mathematics Departments though many have added responsibility for Mathematics Education. Entrance to the program can take place after the Bachelor's degree or equivalent in Mathematics has been achieved, but the graduation requirement in mathematics is high, as is necessary for future teachers of undergraduates. Current research includes two or three projects in the general area of curriculum development for teacher education. The John F. Kennedy Center for Research and Development makes available a wide variety of ongoing research opportunities. Demonstration and experimental schools are operated both at the elementary and pre-school level and at the college preparatory level.

Pennsylvania State University

Ralph T. Heimer
Mathematics Education
171 Chambers Building
University Park, Pennsylvania 16802

Doctoral programs with an emphasis in mathematics education can be designed to lead either to a D.Ed. or a Ph.D. degree. The D.Ed. degree is intended to meet the needs of candidates who plan careers in K-12 school settings (e.g. superintendent of mathematics) while the Ph.D. degree is intended to meet the needs of candidates who wish to work at the college or university level. Consequently, the Ph.D. degree is substantially more research oriented than the D.Ed. degree.

Curricular and instructional theory development is a primary emphasis in all doctoral programs, and special attention is also given to the various forms of computer-aided instruction. In general, the coursework for a doctorate represents a balanced sampling from the areas of mathematics, computer science and behavioral science in addition to a thorough educational grounding.

University of Pittsburgh

F.H. Bell
Mathematics Education
2310 Cathedral of Learning
Pittsburgh, Pennsylvania 15213

A new Mathematics Education Program at the doctoral level was begun in 1970. The first graduates are expected to emerge in 1973. It is described as a "competency based" doctoral program in which all students take Doctoral General Examinations shortly after admission to the program for the purpose of assessing specific strengths and weaknesses. The curriculum taken is then based on the results of these examinations. Thus Pittsburgh does not set many specific minimum course requirements for the degree, relying instead on the competencies of each candidate to decide these. Field experiences undertaken by all candidates include teaching assistantships, supervision of student teachers or MAT candidates, and research in curriculum development during the spring term.

The degrees (Ed.D., Ph.D.) differ chiefly in the nature of the dissertation -- that in the Ed.D. being usually a contribution to the practice of secondary mathematics education, while the Ph.D. thesis contributes to theory or methodology of Mathematics Education. The faculty have interests in Learning Theory and particularly "Computer Augmented Learning." These research interests are taken up by doctoral students and to some degree are integrated with their curricula.

Purdue University

R.B. Kane
Mathematics and Science Education
Division of Mathematical Sciences
West Lafayette, Indiana 47909

Education is not a school of its own at Purdue, and has not grown to the scale set by Schools of Education elsewhere. It produces Elementary school teachers in a variety of fields, while at the secondary level, 80 undergraduates are specializing in Mathematics, and a further 50 students are doing master's degrees in Mathematics Education. Thus the four part-time faculty in Mathematics Education are overseeing a substantial number of students. The doctoral students (about three per annum) are being trained primarily for teacher education positions at the secondary/elementary levels. There is no specialty in College Teaching of Mathematics, presumably better handled by the Mathematics Department.

The current research and development projects include studies in Learning Theory and Cognitive Development, and the development of texts in pre-college and junior college mathematics, together with sets of individualized instruction materials. A similar development is ongoing at the elementary levels.

University of Rochester

Norman G. Gunderson
Department of Mathematics
Rochester, New York 14627

A single faculty member is responsible for Mathematics Education at Rochester. Professor Gunderson holds a joint appointment in Education and Mathematics. The School of Education is very small by national standards. Two programs are outlined - one leading to the Ed.D. in Curriculum (Mathematics) and the other in Teacher Education - secondary level. The curriculum is fairly typically divided, with the exception that the minor area (outside Foundations of Education, Mathematics, or Mathematics Education) is a required twelve units in Behavioral Sciences. No specific formulas are given for admission requirements, except in Mathematics Competency expected - which is the common standard of about 15 units past the B.A. degree.

University of South Carolina

J.M. Ott
College of Education
Columbia, South Carolina 29210

With only a small doctoral Mathematics Education program, manned by one faculty member, University of South Carolina has granted only one Ph.D. in Mathematics Education in the past four years. However, the number of current students (15) suggests increased activity. The program varies with each student, but is normally oriented to Secondary Teacher Education and Research. The responses to the questionnaire suggest nothing unusual about standards expected or the "typical" curriculum taken; except that the total coursework (60 credits) is low, particularly in Mathematics Education and in the number of credits granted for dissertation work.

Southern Illinois University

D.D. Paige
Department of Elementary Education
Carbondale, Illinois 62901

The goals of Southern Illinois University's doctoral program and the research interests of the faculty are primarily Elementary Mathematics Instruction. The graduate Mathematics Education course offerings also concentrate in this area. However, one may enter the program with a secondary concentration by completing a greater total number of mathematics courses. In spite of the large size of the Mathematics Education faculty (six members) and the Education School (200 faculty), there are as yet only a small number of doctoral students in Mathematics Education - about one Ph.D. is granted annually.

University of Southern Mississippi

Dr. Paul Peddicord
Dept. of Curriculum and Instruction
Box 206, Southern Station
Hattiesburg, Mississippi 39401

The Department of Curriculum and Instruction in the College of Education and Psychology administer this degree with cooperation from the Mathematics Department. There are no Mathematics Education specialists in the School of Education and Psychology, but nevertheless, the Mathematics Department personnel do not assist in supervising dissertations. Mathematics faculty will take part by teaching courses and serving on doctoral committees. The three faculty concerned with

Mathematics Education consist of two from Mathematics, and one from Education. The program emphasis is on college mathematics teaching, supervision of school mathematics, or curriculum development. Teacher Education goals are not stressed, and an elementary specialist is not offered. Fully half of one's graduate curriculum will be mathematics; the breakdown of the other half was not specified in our questionnaire.

Stanford University

E.G. Begle
School of Education
Stanford, California 94305

Stanford has a graduate School of Education, but no undergraduate teacher preparation. Two faculty have half-time positions in Mathematics Education. About 20 master's degrees and one Ph.D. are granted annually. The orientation is toward Research and Development - in Education. Thus one may specialize in Learning and Instructional Theory, Research Methods, Evaluation and Measurement, but not in Supervision or in College Teaching and Curriculum. Teaching experience is not a prerequisite for the program.

Students interested in secondary level mathematics education should achieve the equivalent of a master's degree in mathematics while those interested in Elementary Mathematics Education should have their master's in Psychology, with emphasis on Child Development.

Education field courses are offered in four areas: (1) Curriculum, Instruction, Administration and Supervision (practical areas) 12 units; (2) Behavioral Sciences - (learning, child development, social psychology of education, and other such theoretical areas) 12 units; (3) Normative Studies (Philosophy, Sociology) 6 units; (4) Inquiry Skills (Research tools - Computer Science, Statistics, Measurement, and Research Methodology) 15 units.

Temple University

Jesse A. Rudnick
Mathematics Education
Philadelphia, Pennsylvania 19122

Temple University is a large institution having nine faculty members professionally involved in Mathematics Education. The doctoral program (Ed.D.) has both an elementary and secondary component which suggests a K-12 type program. Although admission criteria were provided as a bench mark, flexibility seems to be the word which best describes the criteria for the individual program. No minimum program requirements were given since programs are defined by the candidate and his advisory committee. The Mathematics Education faculty is active in both research and developmental activities.

University of Tennessee

Donald J. Dessart
Dept. of Curriculum and Instruction
Knoxville, Tennessee 37916

Mathematics Education at Tennessee is administered through the Department of Curriculum and Instruction of the College of Education, but is strongly supported by the Department of Mathematics through staff commitment (two have joint appointments with Curriculum and Instruction) and graduate student financial aid.

The current doctoral program (Ed.D.) in Mathematics Education began in 1966 and has graduated five students to date with ten students currently working toward degrees.

Admission criteria are flexible but favor high GRE scores, at least Masters degree level training in mathematics, and some teaching experience at the secondary school level. In addition to Mathematics Education, the program includes educational curriculum, philosophy, research, and some advanced mathematics and statistics. Research in elementary school, secondary school, or college level problems are possible.

Graduates have taken positions in University Education Departments, College Mathematics Departments, and High School Mathematics Departments, with about half engaged in administration, half in teaching and research.

University of Texas at Austin

L. Ray Carry
Mathematics Education
Sutton Hall
Austin, Texas 78712

To emphasize the interdisciplinary nature of Mathematics Education, the faculty include three in Education, three in Mathematics, and three holding joint appointments. The faculty is felt to have complimentary interests covering a full range of areas from curriculum development, to teacher education, from pure mathematics to research methods. Mathematics Education is administered through the Committee for Graduate Studies in Science and Mathematics Education in the School of Education. There are 17 full-time doctoral students currently. The orientation is towards teacher education, research and development, though the majority of graduates nevertheless have taken jobs in Mathematics teaching. Specialization takes place broadly at the Elementary, Secondary, or Higher levels, with variations from 24-45 graduate hours of mathematics being the main curricular differences. Elementary and Secondary specialists take six hours of Research tool courses in place of some of the mathematics.

University of Toledo

Thomas Gibney
Curriculum and Instruction
College of Education
Toledo, Ohio 43606

Mathematics Education at Toledo is a special area within Curriculum and Instruction in the School of Education. Three full-time faculty are employed within this department to be responsible for Mathematics Education with no joint appointments from the Department of Mathematics. The Education faculty numbers 100, and the Mathematics faculty 40 which is representative of most institutions granting the doctorate in Mathematics Education. The University of Toledo grants one to three doctorates annually in Mathematics Education.

A unique feature at Toledo is the recent development of a completely self-instructional program for the undergraduate training in Mathematics Education. Called a "Competency Based" teacher education program, it uses self-instructional modules written with an eye to behavioral objectives. It is assumed that this constitutes an excellent training for teachers who will themselves be designing self-instructional courses in the schools after graduation.

Doctoral candidates may specialize in all levels of curriculum -- elementary, secondary, and college. It was not reported how the requirements for mathematics coursework will vary. Teaching and curriculum development are seen as the primary goals for graduates, taking precedence over supervisory functions or educational research.

Utah State University

Dr. Ross R. Allen
Mathematics Education
Logan, Utah 84322

The title of the degree - Ed.D. in Supervision and Curriculum Development - describes the emphasis of Utah State University's program in Mathematics Education. Teacher Education at the Secondary level, Curriculum Development, and Supervision are high priorities. College mathematics teaching is relatively low. All candidates for the degree must do internships in supervision of student teachers. The faculty consists of two part-time appointments, one from each of Education and Mathematics.

University of Virginia

William C. Lowry
College of Education
Charlottesville, Virginia 22903

Mathematics Education is a specialty available under the Doctor of Education degree, and does not have its own special regulations. The major emphasis of most students is Secondary Teacher Education, but emphasis in Elementary or Higher Education is equally possible. Students intending to teach college mathematics are better served by taking a degree in Mathematics or Higher Education, since the Mathematics Education specialty is really designed for Teacher Educators. One professor in Education is full-time in Mathematics Education. There are currently four full-time and twelve part-time students working on doctorates.

West Virginia University

Boyd Holtan
School of Education
Morgantown, West Virginia 26506

Mathematics Education is housed within Curriculum and Instruction in the School of Human Resources and Education. In the past three years, only one Ed.D. has been granted in the area. This graduate found employment in a College Mathematics Department working on Teacher Education programs. The faculty and student body in Education are moderately large, with three faculty assigned at least part-time to Mathematics Education. The focus of the degree is Teacher Education, Supervision, and Research rather than college mathematics Teaching. Candidates typically enter with a B.A. or equivalent in mathematics and finish with an M.A. equivalent. No language requirement accompanies the degree. The required curriculum is equally divided between Mathematics and Education Foundations with a small requirement in Mathematics Education courses specifically.

West Virginia works with a "contract" system for choosing doctoral student curricula. The candidate makes a contract with his committee for a series of experiences (exams or projects) which will pinpoint his competencies and weaknesses and affect his courses. Some candidates may never take written field examinations. Current research is in the use of Manipulative Activities in Mathematics Education courses.

University of Wisconsin

Thomas A. Romberg
Dept. of Curriculum and Instruction
Madison, Wisconsin 53706

Our questionnaire simply did not fit the situation at the University of Wisconsin. The program is highly individualized and determined primarily by the candidate and his major advisor. A passage from a letter accompanying an understandably incomplete response to the questionnaire follows:

"Our goal is to produce scholars in the field of mathematics education. We do not think a Ph.D. program should be a job training program. True, many of our graduates will indeed take kinds of positions where they will be responsible for teaching mathematics or preparing teachers or supervising school mathematics programs, but our Ph.D. program is not directed toward any occupational goal. Nor do we have areas of specialization. It is up to the individual student and his advisor to plan his program. It will include an area of specialization which might be any one of those listed or several others. And, admission to the doctoral program is primarily a function of the willingness of the major professor to work with an individual. Thus, there are no course requirements for any doctoral candidate in any area of the University. For example, students may have considerable mathematics background or none. The only requirement is that the major professor be willing to work with the student."

This passage illustrates the difficulty of trying to capture the range of doctoral programs in mathematics education in a single questionnaire. It also illustrates what must have been a common reaction among our respondents - that doctoral programs are so individualized that to reduce them to statements of commonality is to lose perhaps their most important feature. We sympathize with this reaction and support the thesis it expresses. Still we believe that prospective doctoral candidates may be able to select a program better suited to their own background and goals having more complete data available as a baseline for comparison. And those of us involved in administering doctoral programs or advising prospective candidates can surely profit from a bit more knowledge of what our colleagues are doing. We offer this report toward those ends.